Do Border Effects Alter Regional Development: Evidence from China

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Abstract

Market access/potential are main explanations for spatial variation in economic activity. Past research has recently used the quasi-natural experiment of the imposition and removal of Iron Curtain to assess how changes in market access influenced economic outcomes. Rather, we focus on key quantity effects of market access by tracking population changes induced by the creation of a subnational border. We exploit a quasi-natural experiment in China and use a difference-in-difference identification strategy to estimate the effects of introducing a new border when Sichuan province was split into Chongqing and Sichuan in 1997. We find that the new border has negative population effects on Sichuan counties located near the new border. These counties experienced a substantial decline in population growth after 1997 compared to Sichuan counties farther from the border, with the negative effects mainly confined to a band within 50-100 kilometers to the new border. Further investigation with falsification tests found that such border effects are unique to the new border region and are not related to the new Sichuan border region being more rural or to being on any provincial border.

Keywords: border effects; population changes; difference in difference; market access; agglomeration; China

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1. Introduction

Border effects have long interested international economists examining the validity of the "law of one price." In the case of regional and urban economists, the interest in border effects is more recent and regards how transactions costs due to a border may affect agglomeration economies, and in turn market potential/access. Models including the New Economic Geography posit that greater market access is a key feature in the development of the urban hierarchy. Moreover, market access/potential are key explanations for spatial variation in economy activity (e.g., Krugman 1991; Hanson 1996).

There is a large empirical literature assessing the quantity effects of home-market and market access on regional economies. Redding and Sturm (2008), among others, investigate population changes in cities located near the border between East and West Germany after the country's division in the wake of the Second World War and reunification in 1990. Brakman et al. (2012) test whether border cities or regions are more affected by EU integration than more core-central locations given that border regions may be more dramatically influenced by the changes of market potential. In similar analysis, Partridge et al. (2008) find that proximity to cities in the urban hierarchy is more important than simple market access in driving population growth across U.S. counties. Faber (2014) and Baum-Snow et al. (2016) assess how highway construction in China has affected local industrial output by reducing transport costs and increasing market size. Similarly, Percoco (2016) examines the effects of highway on employment and the number of plants in Italy.

Hanson (1997) and Redding and Venables (2004) address price effects, finding that market access is positively associated with wages and income per capita, whereas Fallah et al. (2011) report that market access is positively linked to income inequality. Partridge et al. (2009) show that U.S. county wages and housing values are unaffected by market access, however they are strongly affected by proximity to varying sized cities in the urban hierarchy. Brülhart et al. (2012) study both regional-employment and nominal-wages responses in Austria after the opening of Western and Central

European markets after the Iron Curtain fell. They find that places closer to the former Iron Curtain benefit more from increases in market potential.

In this paper, we focus on the quantity effects of market access. We exploit a quasi-natural experiment in China and use a difference-in-difference identification strategy to estimate the effects of introducing a new border when Sichuan province was split into Chongqing and Sichuan in 1997. Following the New Economic Geography and agglomeration literatures, when Chongqing was separated from Sichuan, there was a decrease in market access for Sichuan counties close to the new border (assuming border-effect costs, which we describe below). In addition, given that Chongqing was the region's main urban center, moving it into a new province upset the economic dynamics of nearby Sichuan counties. With this approach, we control for common shocks and isolate the effects of the new border by examining pre- and post-1997 population growth in Sichuan counties close to the border compared to those in its interior.

Our central contribution is that we assess border effects for a different type of border – establishment of a provincial subnational border – and to another continent with considerably different historical and institutional circumstances than the imposition and removal of Iron Curtain in Europe as in Redding and Sturm (2008) and Brülhart et al. (2012). Our estimates suggest that the new border between Chongqing and Sichuan has negative population effects on Sichuan counties located near the border. These counties experienced a substantial decline in population growth after 1997 compared to counties more remote from the border. The negative border effects are mainly confined to a band within 50 to 100 kilometers to the border.

In falsification tests, we find that other Sichuan regions near *other neighboring provincial* borders do not experience such negative effects, supporting our conclusion that it is the *new* border that is causing the outflow of population. Similarly, descriptive evidence also found that border regions in other provinces adjacent to the new Chongqing province also experienced slower growth, though not as negative as the Sichuan border region. Likewise, we find that it is not rural regions in general

that experienced population outflows.

Along with using *resident* population to assess the border effects, we also test whether the new border affects *Hukou* population. These results show that the new border does not have significant effects on *Hukou* population in the border region compared with other Sichuan regions. This suggests that many of the original *Hukou* residents near the border left to work elsewhere after 1997.

Clearly, such border effects only exist when there are transaction costs for cross-border trade and movement of factors of production.[1] Thus, we also contribute to the literature on China's domestic market integration. Poncet (2003, 2005) studies the degree of domestic market in China by examining trade flows, finding large provincial border effects during the 1990s. Xu and Fan (2012) use a gravity model and input-output data to find further evidence of provincial border effects in China, but they are smaller than suggested by Poncet. Indeed, there are reasons to expect that there are provincial border effects due to factors such as the *Hukou* system, local competition and protectionism, differing provincial tax practices and regulations, as well as other features such as state owned enterprises. Our results suggest that the new border matters for regional development, but after there is a new equilibrium, population growth near provincial borders may revert to their prior equilibrium trend of *growth* rate. However, it is the *level* of resident population that is lower than what it would have otherwise been.

2. Background on the New Border

Why was Chongqing separated from Sichuan province to become an independent provincial city in the mid 1990s?[2] There are at least three explanations.[3] First, Chinese disparities between the inland and coastal regions deepened during the 1990s

[1]In the international trade literature, there is a related border effects literature investigating whether differences in transactions costs at the border overturn the "law of one price" (Engel and Rogers, 1996; Anderson and van Wincoop, 2003; Boivin et al., 2012; Anderson et al., 2016). For example, despite many similarities, there appears to be rather large border effects between the U.S. and Canada. While our work is on the same border-effects topic, it relates to a different question of agglomeration and market-access effects.

[2]There are four provincial cities in China. Besides Chongqing, the others are Beijing, Shanghai and Tianjin.

[3]See Pu (2009) for more information on the separation of Chongqing from Sichuan told by the first Major of Chongqing after Chongqing was separated from Sichuan.

after nearly 20 years of rapid economic growth.[4] It was thought that Chongqing, as one of the largest inland industrial cities, had to change its governance in order to catch up with coastal growth. Second, Sichuan's population had already exceeded 100 million before 1996 and there were 221 county-level administration units in the province. The high administrative costs from having so many administrative units and a large population induced the central government to consider disaggregating Sichuan province. Third, there were large labor demands for constructing the Three Gorges Dam, as well as migration for those displaced by the project.[5] It was viewed that one approach to manage the large migration flows was to change the administrative boundaries. Given that Chongqing is the largest city in southwestern China and in the upper and middle reaches of Yangtze River, it acts as transportation center of these regions. Thus, the central government separated Chongqing from Sichuan province to become an independent provincial city in 1997.

We treat the separation of Chongqing as a quasi-natural experiment. We argue that placing the new border between Chongqing and Sichuan was an unexpected exogenous change. While the separation of Chongqing had been discussed before 1997, the exact border was not publicized before the central government approved the division on March 14, 1997. In fact, the central government considered four different plans to divide Sichuan and it was unclear which plan would be implemented until the central government's final decision. Though Chongqing was separated from Sichuan, note that Sichuan province still included Chengdu, which is also one of China's major cities, but is not nearly as large as Chongqing.

Economic growth in Chongqing accelerated after 1997, though it initially lagged in population growth after the division. Its average GDP growth rate has been above 10% in the past 20 years. In fact, Chongqing's recent growth has been among the highest across all provinces since China entered the "New Normal Era."[6] In order to

[4]For recent discussion on regional disparities in China, see Chen and Groenewold (2013, 2014), Herrerias and Monford (2015), and Li et al. (2017).

[5]The Three Gorges Dam is the main project for constructing the largest hydroelectricity plant in the world. Construction started in 1994 and ended in 2006. For more information about the Three Gorges Dam, see Jackson and Sleigh (2001).

[6]China's economic growth has slowed since 2012 with President Jinping Xi stating that China's economy had entered into a "New Normal" in 2014. See Huang et al.(2013), Cai and Roberts (2015) and Lin et al.(2016) for

examine the effect of the new Chongqing-Sichuan border on regional development, we calculate the growth rate of *resident* population between 1982 and 1990 (before the new border) and that between 2000 and 2010 (after the new border) in counties of Sichuan province after controlling for other factors that may affect county growth.[7] We report these population growth rates in Figure 1 and 2. Due to data constraints, our empirical analysis will focus on the Sichuan side of the border because Chongqing's counties were completely redefined after the separation, making direct before- and after-comparisons impossible—e.g., there were approximately 10 Chongqing counties within 50 kilometers of the new border pre-1997 and roughly 32 thereafter. Yet, this follows similar analysis by Redding and Sturm's focus on Western Germany (2008) and Brülhart et al.'s (2012) assessment of Austria.

The theoretical predictions are quite clear as to how Sichuan's new border counties should suffer with the border's introduction due to higher "costs" to reach Chongqing's markets. Conversely, for Chongqing's "new" border counties, it is *a priori* unclear what would happen. Namely, these new Chongqing border counties also lose market access in Sichuan after the border is established, but this is offset because they still have close access to Chongqing (and Chongqing's economy may gain due to improved governance), while losing some competition from nearby Sichuan counties.

Figure 1 and 2 about here

To assess this issue, Figure 1 indicates that 1982-1990 Sichuan population growth varied along the future Sichuan-Chongqing border with both high and low rates of population growth. During the 2000-2010 period (Figure 2), counties with low growth rates appear to be concentrated along the new border, while growth appears to be faster in the interior of Sichuan province. Together, the two maps suggest that Sichuan counties along the new Sichuan-Chongqing border suffered. The difference in population growth rates between the two periods (Figure 3) reinforces the notion that

more discussion of the New Normal and the slower growth in China.

[7]We use population census data which are conducted once every ten years. We will mainly focus on the regional effects in Sichuan province in this paper given data constraints. See more discussion on this in next section.

counties closer to the border had less population growth in the first decade of 21st century.

Figure 3 about here

It is useful, therefore, to first explore whether the new border regions experienced different outcomes with Chongqing province's creation. Thus, for various periods, Table 1 reports the growth rates for 0 to 50, 50-100, and greater than 50 kilometers from (1) the respective border for the new Sichuan border counties (along Chongqing); (2) for Chongqing's border regions; and (3) the Hubei, Hunan, Guizhou, and Shaanxi provincial border regions along the new Chongqing province. To make comparisons, we also report the difference in growth rates between less than 50 and more than 50 kilometers from the respective border. Growth rates for 50-100 kilometers from the border are also shown to illustrate if the whether any effects extend beyond 50 kilometers. The selected periods are 1982-1990 (pre-division decade), the 1990-2000 decade when the division took place (which would have a mixture of offsetting effects), and the 2000-2010 decade that should more clearly reflect the effects of the division given the sufficient passage of time.

Table 1 about here

Between 1982-1990, total population in Sichuan counties within 50kms of the new border grew 7.9% but lost 14.6% population between 2000-2010, while their Chongqing counterparts respectively gained 5.5% and lost 13.4% population during the two periods. Thus, population growth rate for Sichuan counties along the border declined by about 22.5% during the period versus a decline of only 18.9% for corresponding Chongqing border areas—consistent with the new border isolating these Sichuan border areas from Chongqing. However, the relative decline in Chongqing border counties also suggests they have experienced adverse effects from the creation of the new border.

In addition, when considering the difference between growth for Sichuan counties greater than 50 kilometers to those less than 50 kilometers, in the 1980s, growth was about 1.2% greater in what would become the new border region. Yet, this advantage

for Sichuan border regions did not extend into the 1990s with "interior" regions growing 3.3% faster, rising to a 17.4% advantage in the 2000-2010 decade. While not directly comparable due to boundary changes, Chongqing counties within 50 kilometers of the new border also suffered a relative decline in growth rates. In the 1980s and 1990s, "interior" regions were growing just over 1% faster than what became counties that border Sichuan. However, the gap increased to nearly 7% in the latter period. Thus, the results are consistent with the prediction that border regions on both sides fare worse with the creation of the border.

The other four provinces that border the new Chongqing province would likely be negatively affected by border effects, which may be offset by Chongqing's net economic performance after the division (given that Chongqing could have been negatively or positively affected). For example, they may lose some access to traditional Sichuan markets. The results suggest that for these four provinces, their Chongqing-province border regions had an average growth rate that was greater than elsewhere in these four provinces during the 1980s and 1990s. However, this drastically changed in the 2000-2010 decade when the Chongqing border regions in these four provinces lagged by about 6.5%, similar to the results for Sichuan and Chongqing. Thus, the consistent story is that areas along the new Chongqing border experienced the predicted relative population decline after the border's establishment.

Figure 4 about here

We now assess whether the creation of Chongqing province had beneficial effects on its growth. As noted above, Chongqing was Sichuan province's economic engine prior to the division but afterwards, Chengdu became Sichuan province's engine. To assess whether Chongqing's relative performance improved after the division due to improved governance factors, Figure 4 compares resident population in Chengdu to Chongqing over the 1990-2010 period. The graphs clearly show that while Chongqing is generally larger than Chengdu, its growth trends diverge around the division point in 1997. Chengdu's population continued to expand while Chongqing's population declined after 1997 before exploding after 2004. Thus, this pattern is supportive of the

notion that the dominant factor, at least initially after the division, was a decline in market access hurting Chongqing and border regions to the new province, while economic growth shifted to the interior of Sichuan province with Chengdu becoming more prominent.

3. Estimation Strategy and Data

Our theoretical expectations of the effects of the new border can be formally derived in models proposed by Redding and Sturm (2008), Hering and Poncet (2010), and Brülhart et al. (2012). Interested readers can consult those papers. We also use an empirical approach similar to Redding and Sturm (2008) and Brülhart et al. (2012), though with some added changes to reflect our specific setting. For the 1982-1990 and 2000-2010 periods, we regress population growth in Sichuan counties (*PopGrow*) on a dummy for border regions (*Border*) and a dummy that is equal to one for years after 1997 (*Post1997*), and their interaction, as well as a set of control variables (*X*). Our primary estimation equation is the following:

$$PopGrow_{it} = \alpha(Border_i * Post1997_t) + \beta Border_i + \gamma Post1997_t + X_{it}\delta + e_{it} \qquad (1)$$

where α is the coefficient of interest that measures how population in the new Sichuan border regions (the treated group) evolves differently than other Sichuan regions (the control group) after the border was implemented in 1997. The use of 1982-1990 has the advantage of being far enough prior to the new border to rule out anticipation effects while the latter period is far enough after the new border was introduced to allow for migration to begin. As noted, beyond the descriptive analysis above, we are unable to do the same on the Chongqing side of the border because the redefinition of counties makes this impossible.

We include multiple geographic and regional variables as controls to account for a host of various alternative hypotheses for differing growth rates. First are three distance variables Dis_Chengdu, Dis_Chongqing and Dis_SC_Border, which measure the distance from each county in Sichuan province to Chengdu, Chongqing, and the

border of Sichuan with other provinces respectively.[8] Sichuan counties bordering other provinces should have experienced any negative *level* border effects long ago and they should now be on their long-run equilibrium growth paths with respect to being a border region (and thus their contemporaneous *growth rates* should no longer be negatively affected by being near a provincial border). We measure distance with road distance, which is computed using GoogleMap. These distance variables account for how proximity to large agglomeration economies and existing borders affect growth due to commuting and market access for products (Chen and Partridge, 2013). We also include four regional dummy variables in the model. Dum_Minority is a dummy indicating whether it is a county receiving minority preferential policies from the central government. Dum_CD_District is an indicator variable for whether the county (or district) belongs to Chengdu. Dum_County is dummy for rural counties that are not urban and Dum_City_District is an indicator variable for whether it is a city district. We use these geographic and regional variables to control for the possibility that (new) border regions differ systematically from other Sichuan regions, not only due to the new border, but also in terms of their distance to large cities and to the existing borders, as well as different industrial structures given the varying county/district/city types.

We include 1982 county population in the model as a measure of agglomeration economies. We use 1982 population, which is the earliest census data available with consistent county boundaries, to avoid potential reverse causality effects of migration on population. In addition, we add the interactions between population and the border effects dummy to investigate whether border counties with more agglomeration fared differently—e.g., more populous border counties may have better avoided population decline (Redding and Sturm, 2008).

The geographical unit we analyze is county (*Xian*), county-level city (*Xian Ji Shi*) and districts under cities (*Shi Xia Qu*). We refer to them as county hereafter. Therefore,

[8]The fixed effects (differenced out) contain the average distance (*level)* effects, while the distance variable coefficients reflect the *change* in the effects of distance over the period. Thus, the distance results need to be interpreted accordingly. The same applies to the other control variable coefficients.

we focus on 134 Sichuan counties, including 120 counties, 7 county-level cities, and 7 city districts.[9]

We first use *resident* population as our dependent variable from the *China Population Census*. Since the population census is conducted by National Statistical Bureau (NSB) every 10 years, we use resident population data in 2000 and 2010 to compute population growth after 1997 and similarly use population data in 1982 and 1990 to compute population growth before 1997.[10] We also use census population data to construct the control variable of agglomeration economies for spatial heterogeneity. Given that we have one observation for population growth in the period before 1997 and one observation for the period after 1997, we estimate the model with OLS.

We also use the *Hukou* population as another dependent variable in sensitivity analysis. The *Hukou* population includes those registered (most were born) in that county, while resident population includes those who live in that county. *Hukou* has affected the labor market dramatically. Workers without local *Hukou* have little or no access to public welfare provided by local governments and they may also face discrimination in the labor market.[11] Given the intricacies of the *Hukou* system, it is typically easier to migrate within a province than across provinces. The establishment of the new border does not change the *Hukou* status of those on border counties who worked in other regions before 1997.

The difference between *Hukou* population and resident population is that resident population could originate from anywhere. Conversely, *Hukou* population accounts more for "permanent" residents who could be living and working elsewhere. When the *Hukou* population exceeds the resident population, that suggests that many original residents are working/residing elsewhere. The source of the *Hukou* population is from various years of the *Sichuan Provincial Year Statistical Yearbook*.

[9]We do not include Sichuan counties whose boundaries changed dramatically during the sample period.
[10]NSB conducted the first population census in 1953 and then conducted the census roughly every ten years in 1964, 1982, 1990, 2000 and 2010. We use the data after 1982 given the data availability with consistent boundaries at the county level.
[11]See detailed discussions of the *Hukou* system in Bao et al. (2011) and Song (2014).

In this case, because we have annual panel data on population growth, we can estimate the model with a fixed-effects approach.

4. Results

4.1 Baseline

We define the border (*Border50*) as comprising all Sichuan counties whose distance to the Chongqing border is within 50 kilometers. Our measure is road distance to the nearest border crossing to one of Chongqing's neighbor counties. The 50 kilometer dichotomy follows Brülhart et al. (2012) who find that market-access effects decay sharply beyond 50 kilometers. A map of these counties is included in Figure 5.

Figure 5 about here

The first estimation results are reported in Column (1) of Table 2. The coefficient of the interaction term between *Border50* and *Post1997* is negative and significant at the one-percent level. It indicates that in the 10 years after Chongqing was separated from Sichuan, population grew 18.5% less in Sichuan border counties than in other Sichuan counties (all else equal), relative to their respective pre-1997 growth rates, which is somewhat larger than what the simple descriptive statistics indicated in section 2. It further supports the hypothesis that the new border reduced market access for Sichuan counties close to the border.

Table 2 about here

Regarding the geographic and regional dummy variables, the distance to Chongqing is positive and significant while the distance to Chengdu is insignificant. These results are suggesting that Chongqing has some "growth shadow" effects that implies that being further away from Chongqing favorably affects Sichuan county growth, consistent with "backwash" effects found by Chen and Partridge (2013) for China's largest cities. Unlike the distance to the Sichuan-Chongqing border, the distance to the Sichuan border for other provinces is insignificant, suggesting that during the adjustment phase to the new border, nearby counties lost population, which did not apply for Sichuan's other counties that border *other* provinces. Among the

four regional dummy variables, Minority and Counties belonging to Chengdu are all positive and significant, while the other two are insignificant. This is not surprising because minority counties and Chengdu counties can have higher population growth either because they are in favorable location or because they receive preferential treatment from the government.

In column (2), we include the log of population in 1982 and its interactions with border effects to control for spatial heterogeneity among counties. These results show that the main border-effects are still negative and significant. Population is insignificant but its interactions with border effects are positive and significant at the ten-percent level. The two border effect variables (post 1997) are *jointly* significant at the one-percent level. These results indicate that as Redding and Sturm (2008) found, more populated areas fared better with the establishment of the border. Comparing columns (2) and (1), the coefficients for the other variables are mainly unchanged.

In columns (3) and (4), we include counties with a distance to the border between 50 and 100 kilometers as an additional treatment variable (*Border100*) to assess whether the (new) border had spillover effects farther away from the border. These counties are shown in Figure 5. The results continue to indicate that the interaction of *Border50* and *Post1997* is negative and significant in both of cases, whereas its interaction with 1982 population remains positive. Similarly, the interaction between *Border100* and *Post1997* is negative and significant in column (3), but becomes insignificant when the *Border100* is interacted with 1982 population in column (4). However, in column (4), the *Border100* term and its interaction with 1982 population are *jointly* significant at the 1% level. Overall, the border effects appear to die out somewhere between 50 to 100 kilometers from the new border, though more populated border regions fared better. These findings corroborate the distance decay of market access and agglomeration effects found in the literature (e.g., Partridge et al., 2008; Rosenthal and Strange, 2003; Brülhart et al., 2012).

Overall, these results suggest that the "new" border set up by the separation of Chongqing from Sichuan reduced activity in Sichuan counties near the new border.

One possible explanation is that the border increases trade and commuting costs of these new Sichuan-border counties, reducing their growth, at least until their new long-run equilibrium path is attained. Below, we will test the robustness of our findings and take a closer look at the border effects to appraise such effects.

4.2 Robustness

We now conduct a series of robustness checks. Our first consideration is that some Sichuan counties such as Pengxi and Daxian have a distance to the Chongqing border that is only slightly larger than 50 kilometers. These counties may confound the conclusion in the baseline regression that the border effects are confined to 50 kilometers. Therefore, we redefined these counties as *Border50* instead of *Border100* and rerun the regression. However, these results were basically unchanged (not shown for brevity).

We also consider alternative definitions of the control region in Table 3. In column (1), we omit counties within 100 kilometers from Chengdu to avoid the possible urban influence of Chengdu. Our motivation is that counties close to Chengdu may be affected by the strong market access of Chengdu city and including these counties in the sample may confound the border effects of interest. In column (2), we drop city districts and counties/districts directly belonging to Chengdu. In column (3), we exclude counties with a distance within 100 kilometers to Chengdu and provincial border counties that are *not* on the Chongqing border in order to assess whether it is an urban effect or an effect related to any other border. In columns (4)-(6), we repeat the estimations with these alternative control regions by including 1982 population and its interactions with the border as additional control variables in the model.

Table 3 about here

The estimation results using these control groups are very similar to those described in Table 2. The coefficients of interest are not sensitive to the control group definitions. The effects of *Border50* are negative and significant at the one-percent

level in all estimations and the negative effects of *Border100* become insignificant after the interaction terms between population and the border are included. Likewise, the border interaction with 1982 population continues to suggest that more populated new-border counties fared better. Thus, our findings that the new Sichuan-Chongqing border has negative population effects on counties near the border are generally robust.

4.3 Counterfactual Experiments and Falsification Tests

So far, we defined Sichuan counties located close to the Chongqing border as the treated region. Now, we will consider alternative definitions of the treated group as counterfactuals or falsification tests. Specifically, we construct a new *alternative* treated group *(New BorderMCD*) that includes counties that are greater than 100 kilometers away from (1) Chengdu, (2) the border between Sichuan and Chongqing, and (3) the border between Sichuan and *any* other province. In other words, the treated region is a circle band that excludes counties within 100 kilometers to Chengdu and/or any Sichuan county that borders *any* province. These counties are shown in Figure 6 and they generally reflect interior rural counties that are uninfluenced by a major city. We now consider this treated region to examine whether it is really more rural regions that fared poorly after 1997. The estimation results are reported in Table 4.

Figure 6 about here

Table 4 about here

The results in Table 4 are reported in the way as before. We include all the other counties as control region in column (1). We exclude city districts and counties/districts that belong to Chengdu in column (2). We further drop counties at the Chongqing-Sichuan border as well as counties/districts that belong to Chengdu and city districts in column (3). In column (4)-(6), we re-estimate the model by adding population in 1982 and its interactions with the border.

The estimation results show that the interactions between *New BorderMCD* and

Post1997 are positive in all specifications (though not always significant) while the coefficients of the population interactions become negative and statistically significant at the 1-percent level in column (4)-(6). Thus, the main results using the alternative treatment groups for Chengdu and for Sichuan's other provincial border counties are exactly the opposite of using the new Sichuan/Chongqing border as the treatment. Specifically, counties near Chengdu and Sichuan's other borders experience positive growth post-1997, though the effect is mitigated for urban counties. Thus, these results suggest that our previous findings regarding the new Sichuan-Chongqing border are not artifacts of the influence of large cities or simple provincial border effects experienced on Sichuan's other provincial borders.

4.4 Other Borders

To further assess whether we are simply picking up a common border effect for all of Sichuan's provincial borders and not a disequilibrium adjustment on the new Chongqing-Sichuan border, all counties at the border between Sichuan and any other province are now defined as the treatment region. A map of these counties is included in Figure 7. The estimation results are reported in Table 5.

Figure 7 about here

Table 5 about here

As we did in the base regressions, we now include both *BorderSC50* (within 50 kilometers to the border) and *BorderSC100* (within 50-100 kilometers to the border) in the model. First, column (1) and (5)'s models include all other counties as the control region. Second, the models in columns (2) and (6) omit counties which are within 100 kilometers from Chengdu. Third, counties/districts belonging to Chengdu and city districts are omitted in the models shown in column (3) and (7). Finally, the models in columns (4) and (8) omit counties within 100 kilometers to Chengdu and those counties at the Chongqing border.

These results show that there is no indication of negative effects when considering all of Sichuan's borders at once. In fact, most of the coefficients of border

effects are positive and even becomes significant at the one-percent level when population and its interaction with border effects are controlled. It suggests that unlike counties located along the "new" border which have been hurt by the 1997 division, counties close to the other existing borders grew faster compared to other Sichuan counties since 1997. In all, it seems that borders matter in terms of reducing the *levels of economic activity*, but after there is a new equilibrium, population *growth* appears to returns to its old path.

5. Extensions

We used resident population above to assess the border effects because our agglomeration model predictions relate to current residents. Yet, it is also useful to assess whether the new border between Sichuan and Chongqing affects *Hukou* population growth, which may have very different dynamics as they do not have to be residents of the place where they have *Hukou*. Likewise, because a very high share of Chinese regional and urban economic studies use *Hukou* population, it is also useful to see if they indicate similar results as using residential population, which is generally the subject of related theoretical hypotheses. Since we have annual data on *Hukou* population from 1992 to 2013, we estimate this model with a standard fixed-effects panel model. We use population in 1992 to measure initial county size. The estimation results are reported in Table 6.

Table 6 about here

The results show that most of the border effects are negative, though none of them are statistically significant. It suggests that the new Sichuan/Chongqing border does not have any significant effects on *Hukou* population growth in the border region compared with other Sichuan regions. Along with the previous result that the new-border is inversely related to the number of *residents* near the border, our finding that the border has insignificant effects on the *Hukou* population suggests that many of the original *Hukou* residents of the new border region left to work elsewhere, in which we surmise declining economic opportunities is the cause. In addition, as a

further test, when we used the same years and observations as in the base first-difference regression (1982-1990 and 2000-2010), the results are robust, suggesting that our findings are not an artifact of using a different specification (see the Appendix for the results).

Table 7 about here

To further assess our out-migration hypothesis, we next use the ratio of residents to *Hukou* population as the dependent variable and re-estimate the model. In order to match the resident population and the baseline regression, we use the ratio only in 1990 and 2010. We use population in 1982 to measure initial county size. The results displayed in Table 7 indicate that there are strong border effects with the ratio. The coefficients of border effects within 50 kilometers are negative and significant in all the estimations and the border effects beyond 50 kilometers are not significant after 1982 population is controlled.

Taken together, *these* estimation results suggest that the resident/*Hukou* ratio declined in areas closer to the new Chongqing border. As noted above, with the *Hukou* population not being statistically affected by the new border, this suggests that many of the residents near the border left after 1997, perhaps to Chengdu, which was rapidly growing during the period (and to Chongqing after its growth recovered after 2004). In all, these extensions support our findings in the baseline regressions that there are negative border effects in close proximity to the new border. In addition, given the different results for the resident versus *Hukou* populations, one should be cautious in using *Hukou* population as a proxy for residential population—even though *Hokou* population is more readily available.

6. Conclusions

The influence of borders on regional and international economic outcomes has interested regional and urban economists through its effects on market access when there are cross-border transactional costs. Removing a border like the Iron Curtin has been shown to increase market access, leading to economic growth (e.g., Redding and

Sturm 2008; Brülhart et al., 2012). Yet, to date, there have been no studies of the opposite in which a new subnational border is established, where theory generally suggests a decline in market access with a resulting decline in population growth.

In this study, we consider the 1997 case when a new border was introduced after the Chinese province Sichuan was divided into two with a new city-level province established for Chongqing. We examine how Sichuan counties near the new border with Chongqing fared after the new border was established. Using a difference-in-difference approach, we find that "treated" Sichuan counties on the new border fared worse than "control" Sichaun counties in the interior (all else equal). Descriptive evidence for other border regions on the new Chongqing province also showed relative declines in growth rates. These results support the notion that market access was reduced for these counties and they indirectly support Poncet (2003, 2005) and Xu and Fan's (2012) findings that Chinese provincial borders create cross-border transactional costs associated with border effects.

A series of robustness checks were also conducted. We considered whether counties on the Sichuan border of other neighboring provinces also experienced negative effects, finding that they did not experience the negative effects experienced by Sichuan counties on the new border. Likewise, we examined whether we were picking up some rural phenomenon in which it was *all* rural Sichuan counties that suffered over the period. Yet, we find that the new border counties also lagged interior rural Sichuan counties, supporting our findings that we identified new border effects.

The results suggest that the border effects of putting a new border in place correspond to the opposite case of removing border—further strengthening the validity of the agglomeration and New Economic Geography theories behind the influence of market access/potential. In terms of policy, this suggests that policymakers should carefully weigh the net costs of creating new borders (or benefits of removing borders). Nonetheless, in the case Sichuan/Chongqing case considered in this paper, despite the losses experienced on the Sichuan side of the new border, it very well could be that gains from a more coherent governance structure on the

Chongqing side have (or will) overwhelm the negative effects identified in our study. Yet, more research is necessary to determine when changing borders at the regional level to encourage centralization or decentralization is beneficial on balance despite the potential for adverse border effects.

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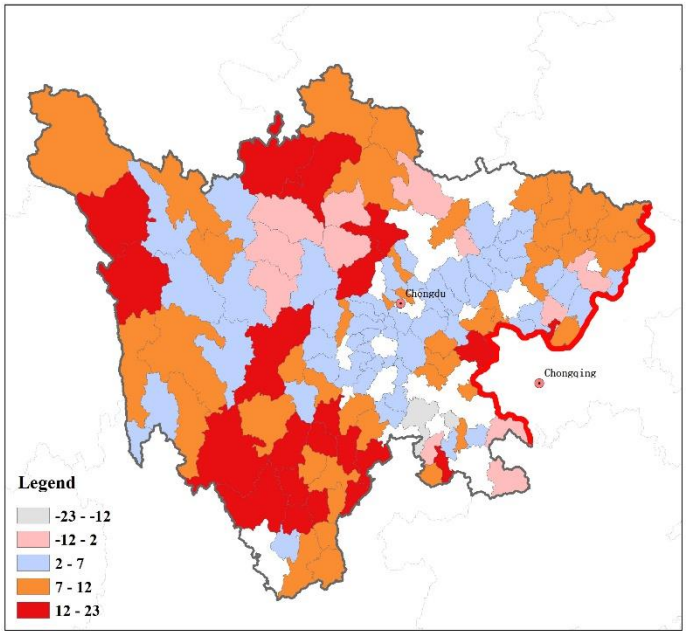
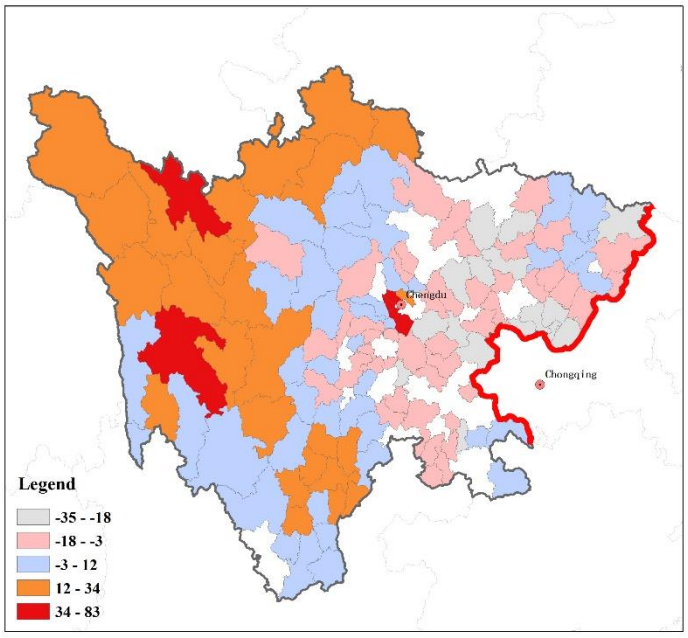
Figure 1: Population Change between 1982 and 1990 in Sichuan Province (%)



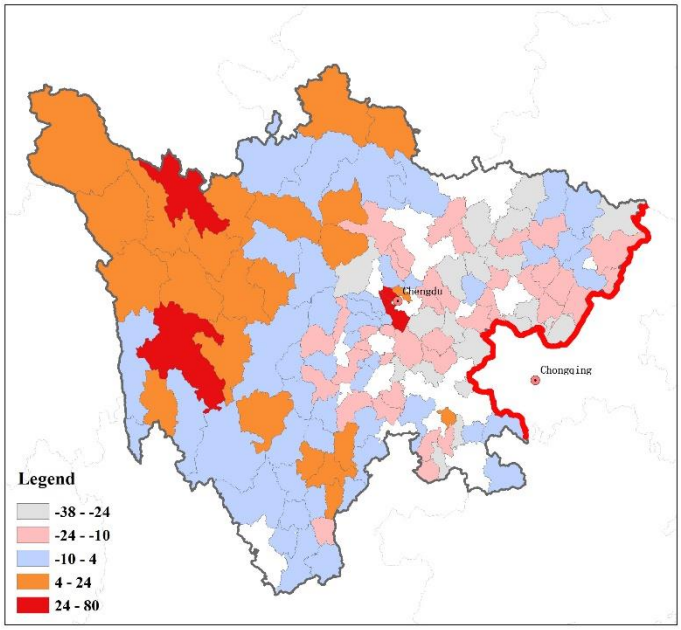
Notes: White is for counties whose data are missing due to their boundaries changing during the sample period.

Figure 2: Population Change between 2000 and 2010 in Sichuan Province (%)



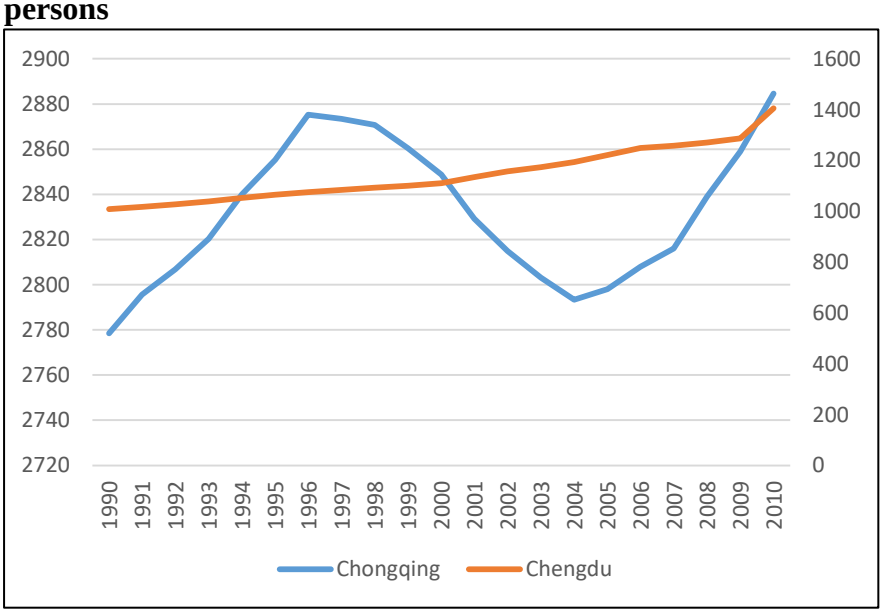
Notes: White is for counties whose data are missing due to their boundaries changing during the sample period.

Figure 3: The Difference of Population Change between 1982-1990 and 2000-2010 in Sichuan Province (%)



Notes: White is for counties whose data are missing due to their boundaries changing during the sample period.

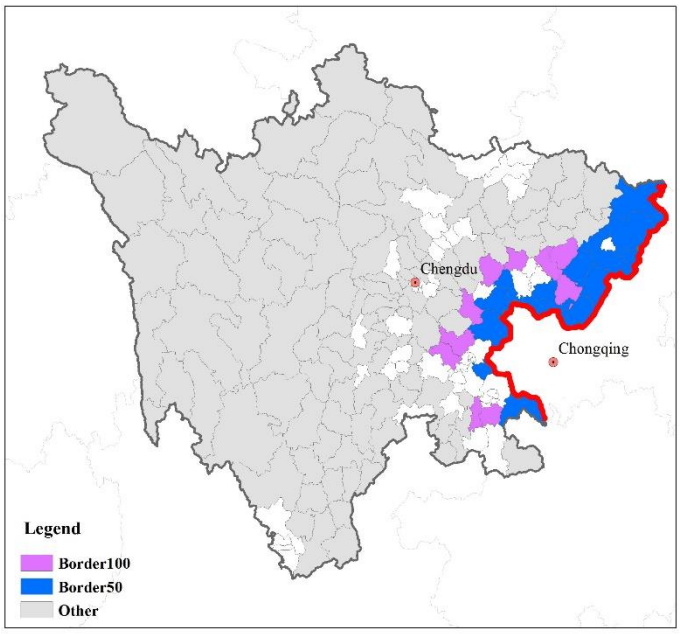
Figure 4: Resident Population of Chongqing and Chengdu (1990-2010), 10,000 persons



Sources: *Chongqing Statistical Yearbook 2016* and *Chengdu Statistical Yearbook 2016*

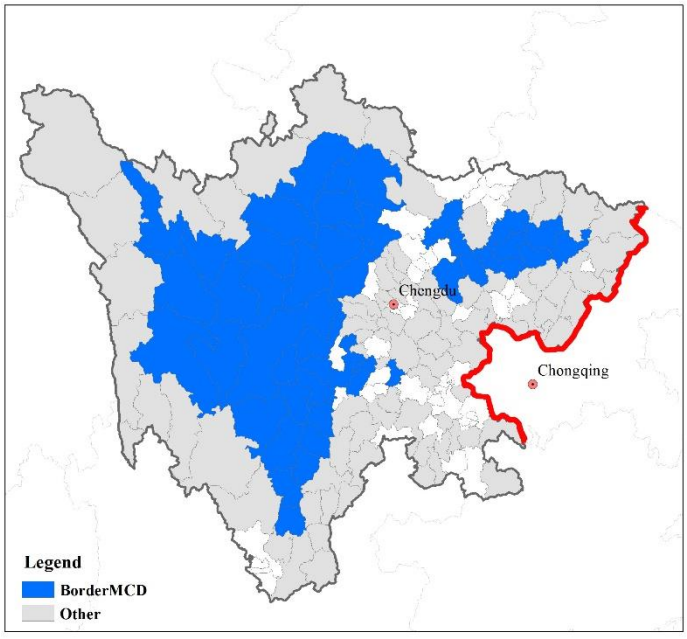
Notes: The left y-axis is for Chongqing and right y-axis is for Chengdu. The resident population between 1990 and 1995 in Chongqing and those between 1990 and 1999 in Chengdu are not available. We used the ratio of resident population to *Hukou* population in 1996 and 2000 to adjust *Hukou* population to get resident population for the two cities respectively.

Figure 5: Borders between Sichuan and Chongqing



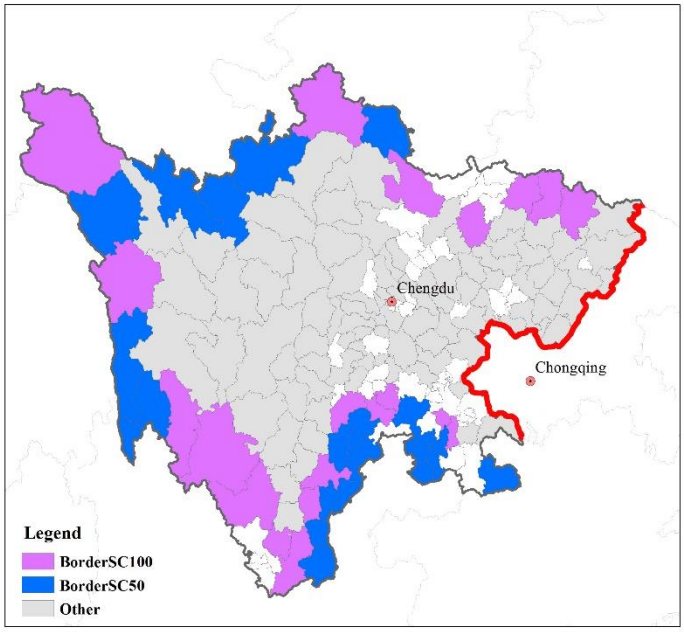
Notes: *Border50* includes counties whose distance to the Sichuan-Chongqing border is under 50 kilometers and *Border100* are counties whose distance to the border is between 50 and 100 kilometers. We measure distance with road distance from the county to the nearest border crossing to one of Chongqing's neighbor counties. The red line is the border between Sichuan and Chongqing. White is for counties whose data are missing due to their boundaries changing during the sample period.

Figure 6: Counterfactual Border



Notes: *BorderMCD* includes counties that are greater than 100 kilometers away from (1) Chengdu, (2) the border between Sichuan and Chongqing, and (3) the border between Sichuan and other provinces. We measure distance with road distance from the county to the nearest border crossing to one of Chongqing's neighbor counties. The red line is the border between Sichuan and Chongqing. White is for counties whose data are missing due to their boundaries changing during the sample period.

Figure 7: Borders between Sichuan and Other Provinces



Notes: *BorderSC50* includes counties within 50 kilometers to the border between Sichuan and other provinces. *BorderSC100* includes counties within 50 to 100 kilometers of the border between Sichuan and other provinces. Distance is measured as road distance from the county to the nearest border crossing to one of Chongqing's neighbor counties. The red line is the border between Sichuan and Chongqing and the black line is the border between Sichuan and other provinces. White is for counties whose data are missing due to their boundaries changing during the sample period.

Table 1: Resident Population Growth Rate (%) in Counties along the Border

Border regions		1982-1990	1990-2000	2000-2010
Sichuan[a]	Border<=50km	7.94	2.11	-14.62
	50km<Border<=100km	5.46	-1.11	-11.37
	Border>50km	6.79	5.36	2.74
	(Border<=50km) – (Border>50km)	1.15	-3.25	-17.36
Chongqing[b]	Border<=50km	5.47	1.23	-13.39
	50km<Border<=100km	5.78	4.08	-5.58
	Border>50km	6.79	2.27	-6.63
	(Border<=50km) – (Border>50km)	-1.32	-1.04	-6.76
Other Provinces[c]	Border<=50km	11.96	4.97	-9.00
	50km<Border<=100km	9.08	-1.06	-5.00
	Border>50km	11.20	3.22	-2.54
	(Border<=50km) – (Border>50km)	0.76	1.75	-6.46

Notes: [a.]Sichuan counties along the border between Sichuan and Chongqing; [b.]Chongqing counties along the border between Chongqing and Sichuan; [c.]The counties in other provinces neighboring Chongqing (including Hubei, Hunan, Guizhou and Shaanxi) along the border between these provinces and Chongqing.

Table 2: Baseline Estimations

	(1)	(2)	(3)	(4)
Border50*Post1997	-18.512***	-57.210***	-19.920***	-58.836***
	(2.879)	(19.517)	(2.935)	(20.129)
Border100*Post1997			-14.191***	-13.366
			(3.601)	(39.527)
Border50	10.338***	9.661***	11.940***	11.316***
	(2.233)	(2.316)	(2.734)	(2.804)
Border100			8.820***	8.936***
			(2.173)	(2.170)
Post1997	-4.048***	-4.048***	-2.641*	-2.641*
	(1.438)	(1.441)	(1.529)	(1.536)
Dis_Chongqing	0.023***	0.016	0.026***	0.019*
	(0.008)	(0.010)	(0.009)	(0.011)
Dis_Chengdu	0.006	0.011	0.004	0.008
	(0.008)	(0.009)	(0.009)	(0.010)
Dis_SC_Border	0.003	0.003	0.001	0.001
	(0.009)	(0.009)	(0.009)	(0.009)
Dum_Minority	6.948***	5.935***	6.938***	5.905***
	(1.805)	(1.836)	(1.816)	(1.860)
Dum_CD_District	13.866***	14.600***	14.139***	14.901***
	(5.030)	(5.129)	(5.006)	(5.115)
Dum_County	-2.747	-1.353	-2.612	-1.199
	(2.494)	(2.585)	(2.576)	(2.670)
Dum_City_District	1.844	2.231	1.911	2.316
	(2.833)	(2.998)	(2.749)	(2.914)
Border50*Post1997*Pop1982		8.955*		9.006*
		(4.743)		(4.878)
Border100*Post1997*Pop1982				-0.190
				(8.988)
Pop1982		-1.244		-1.266
		(1.029)		(1.040)
Constant	-7.861***	-2.120	-8.891***	-3.072
	(2.798)	(5.664)	(2.847)	(5.717)
P-Value of F-Test-1		0.000		0.000
P-Value of F-Test-2				0.001
No. obs.	268	268	268	268
R^2	0.386	0.367	0.384	0.367

Notes: *Border50* defined as counties within 50 kilometers from the Sichuan-Chongqing border. *Border100* defined as counties between 50-100 kilometers from the border.
F-Test-1 is the joint significance test of *Border50*Post1997* and *Border50*Post1997*Pop1982*.
F-Test-2 is the joint significance test of *Border100*Post1997* and *Border100*Post1997*Pop1982*.
Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Robustness Tests of Omitting Different Regions

	(1) Omit <100km to Chengdu	(2) Omit City Districts & Chengdu Counties	(3) Omit <100km to Chengdu & province border	(4) Omit <100km to Chengdu	(5) Omit City Districts & Chengdu Counties	(6) Omit <100km to Chengdu & province border
Border50*Post1997	-19.749***	-19.026***	-18.600***	-72.897***	-68.677***	-63.151***
	(3.001)	(3.012)	(3.213)	(20.116)	(20.489)	(21.984)
Border100*Post1997	-14.021***	-12.281***	-12.872***	-22.545	-29.985	-10.195
	(3.435)	(3.521)	(3.613)	(37.356)	(36.990)	(38.595)
Border50	10.725***	9.180***	11.719***	9.704***	8.111***	11.383***
	(2.607)	(2.614)	(3.299)	(2.774)	(2.749)	(3.429)
Border100	8.674***	8.225***	9.681***	9.114***	8.352***	9.834***
	(2.136)	(2.096)	(2.646)	(2.165)	(2.120)	(2.636)
Post1997	-2.811*	-4.169***	-3.961**	-2.811*	-4.169***	-3.961**
	(1.465)	(1.390)	(1.761)	(1.463)	(1.387)	(1.776)
Border50*Post1997				12.299**	11.582**	10.310*
*Pop1982				(4.873)	(4.965)	(5.244)
Border100*Post1997				1.964	4.105	-0.617
*Pop1982				(8.439)	(8.344)	(8.721)
Pop1982				-2.015*	-1.874*	-0.106
				(1.145)	(0.982)	(1.222)
Constant	-9.750***	-8.256***	-13.148***	-0.894	0.444	-12.717*
	(3.034)	(2.879)	(3.869)	(5.880)	(5.468)	(6.607)
Geography and Region Control	yes	yes	yes	yes	yes	yes
P-Value of F-Test-1				0.000	0.000	0.000
P-Value of F-Test-2				0.000	0.002	0.002
No. obs.	224	232	168	224	232	168
R^2	0.483	0.486	0.510	0.489	0.492	0.509

Notes: *Border50* defined as counties within 50 kilometers from the Sichuan-Chongqing border. *Border100* defined as counties between 50-100 kilometers from the border. In columns (1) and (4), counties within 100 kilometers from Chengdu are dropped; in column (2) and (5), city districts and counties/districts that belong to Chengdu are dropped; in columns (3) and (6), counties within 100 kilometers from Chengdu and those at the border between Sichuan and other provinces are omitted.
F-Test-1 is the joint significance test of *Border50*Post1997* and *Border50*Post1997*Pop1982*.
F-Test-2 is the joint significance test of *Border100*Post1997* and *Border100*Post1997*Pop1982*.
Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: New Interior Rural Sichuan Treatment Region Falsification Test

	(1) Full Sample	(2) Omit City Districts & Chengdu Counties	(3) Omit City Districts, Chengdu Counties, and border	(4) Full Sample	(5) Omit City Districts & Chengdu Counties	(6) Omit City Districts, Chengdu Counties, and border
New BorderMCD	3.258	6.206**	3.376	18.031***	22.036***	19.686***
*Post1997	(2.616)	(2.509)	(2.634)	(4.501)	(4.486)	(4.562)
New BorderMCD	-1.574	-2.731	-1.506	-0.171	-1.165	-0.098
	(1.652)	(1.673)	(1.714)	(1.544)	(1.530)	(1.554)
Post1997	-7.036***	-9.816***	-6.986***	-7.036***	-9.816***	-6.986***
	(1.868)	(1.655)	(1.833)	(1.890)	(1.680)	(1.854)
New BorderMCD				-5.551***	-6.091***	-6.276***
*Post1997*Pop1982				(1.407)	(1.483)	(1.450)
Pop1982				0.540	0.465	-0.082
				(1.129)	(1.067)	(1.125)
Constant	-6.402**	-4.898	-7.019**	-6.990	-4.703	-4.071
	(2.986)	(3.087)	(3.098)	(6.032)	(5.786)	(6.018)
Geo and Region Control	yes	yes	yes	yes	yes	yes
P-Value of F-Test				0.000	0.000	0.000
No. obs.	268	232	206	268	232	206
R^2	0.328	0.435	0.408	0.357	0.482	0.470

Notes: *New BorderMCD* is defined as counties which are located more than 100 kilometers away from Chengdu and/or the Sichuan border with *any* province. In columns (1) and (4), the control region includes all other observations; in columns (2) and (5), city districts and counties/districts that belong to Chengdu are omitted from control region; in columns 3 and 6, city districts, counties/districts that belong to Chengdu, and those at the border between Chongqing and Sichuan are omitted from the control region.
F-Test is the joint significance test of *New BorderMCD*Post1997* and *New BorderMCD*Post1997*Pop1982*.
Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: All Sichuan Provincial Border Counties as Alternative Treatment Group

	(1) Full Sample	(2) Omit <100km to Chengdu	(3) Omit City Districts & Chengdu Counties	(4) Omit <100km to Chengdu & Chongqing border	(5) Full Sample	(6) Omit <100km to Chengdu	(7) Omit City Districts & Chengdu Counties	(8) Omit <100km to Chengdu & Chongqing border
BorderSC50*Post1997	6.815*	8.410**	9.076**	5.587	25.670***	27.413***	28.079***	25.419***
	(3.667)	(3.634)	(3.579)	(3.718)	(7.363)	(7.346)	(7.299)	(7.237)
BorderSC100*Post1997	2.416	4.011	3.842	1.964	18.429**	19.366**	19.426**	18.083*
	(3.513)	(3.445)	(3.402)	(3.532)	(8.427)	(8.474)	(8.574)	(9.469)
BorderSC50	-2.852	-3.978	-3.903	-4.080	-2.278	-3.493	-3.314	-3.988
	(2.987)	(3.074)	(3.130)	(3.275)	(2.881)	(2.955)	(3.023)	(3.094)
BorderSC100	-5.414*	-6.331**	-5.354*	-6.854**	-4.777*	-5.746**	-4.588*	-6.441**
	(2.786)	(2.807)	(2.762)	(2.932)	(2.746)	(2.757)	(2.681)	(2.892)
Post1997	-7.189***	-8.785***	-9.451***	-5.962***	-7.189***	-8.785***	-9.451***	-5.962***
	(1.670)	(1.564)	(1.478)	(1.688)	(1.685)	(1.585)	(1.500)	(1.705)
BorderSC50*Post1997*Pop1982					-7.075***	-7.130***	-7.130***	-7.441***
					(2.267)	(2.267)	(2.255)	(2.229)
BorderSC100*Post1997*Pop1982					-5.358**	-5.138**	-5.294**	-5.551*
					(2.569)	(2.585)	(2.660)	(2.980)
Pop1982					-0.400	-0.579	-0.646	-1.435
					(0.977)	(1.068)	(0.908)	(1.148)
Constant	-5.541*	-5.225	-4.725	-5.750	-1.614	-0.371	0.278	2.892
	(3.291)	(3.636)	(3.448)	(3.927)	(5.309)	(5.447)	(5.120)	(5.867)
Geography and Region Control	yes	yes	yes	yes	yes	yes	yes	yes
P-Value of F-Test-1					0.003	0.001	0.001	0.002
P-Value of F-Test-2					0.092	0.072	0.076	0.161
No. obs.	268	224	232	196	268	224	232	196
R^2	0.339	0.430	0.444	0.415	0.364	0.466	0.481	0.466

Notes: BorderSC50 defined as counties within 50 kilometers from the border between Sichuan and other provinces (excluding Chongqing). *BorderSC100* defined as counties within 50-100 kilometers from the same border. In columns 1 and 4, all observations are included; in column 2 and 5, counties within 100 kilometers from Chengdu are omitted from the control region; in columns 3 and 6, city districts and counties/districts that belong to Chengdu are dropped; in column 4 and 8, counties within 100 kilometers away from Chengdu and those at the border between Sichuan and Chongqing are omitted.

F-Test-1 is the joint significance test of *BorderSC50*Post1997* and *BorderSC50*Post1997*Pop1982*.

F-Test-2 is the joint significance test of *BorderSC100*Post1997* and *BorderSC100*Post1997*Pop1982*.

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Panel Models Using *Hukou* Population

	(1) Full Sample	(2) Omit <100km to Chengdu	(3) Omit City Districts & Chengdu Counties	(4) Omit <100km to Chengdu & province border	(5) Full Sample	(6) Omit <100km to Chengdu	(7) Omit City Districts & Chengdu Counties	(8) Omit <100km to Chengdu & province border
Border50*Post1997	0.100	0.025	0.067	0.002	-0.291	-0.366	-0.324	-0.389
	(0.141)	(0.170)	(0.163)	(0.125)	(0.435)	(0.446)	(0.443)	(0.432)
Border100*Post1997	-0.133	-0.208	-0.166	-0.231	2.387	2.312	2.354	2.289
	(0.236)	(0.254)	(0.250)	(0.227)	(3.276)	(3.282)	(3.281)	(3.291)
Border50*Post1997*Pop1992					0.089	0.089	0.089	0.089
					(0.093)	(0.094)	(0.094)	(0.094)
Border100*Post1997*Pop1992					-0.573	-0.573	-0.573	-0.573
					(0.728)	(0.729)	(0.729)	(0.732)
Constant	0.830**	0.840**	0.838**	0.418***	0.830**	0.840**	0.838**	0.418***
	(0.320)	(0.382)	(0.369)	(0.097)	(0.320)	(0.383)	(0.369)	(0.097)
Year and county fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
No. obs	2814	2352	2436	1764	2814	2352	2436	1764
R^2	0.035	0.041	0.040	0.078	0.034	0.040	0.039	0.077

Notes: *Border50* defined as counties within 50 kilometers from the Sichuan-Chongqing border. *Border100* defined as counties between 50-100 kilometers from the border. In columns (1) and (5), all counties are included in the sample. In columns (2) and (6), counties within 100 kilometers from Chengdu are omitted from the control region; in columns (3) and (7), city districts and counties/districts that belong to Chengdu are omitted; in columns (4) and (8), counties within 100 kilometers from Chengdu and those at the border between Sichuan and other provinces are omitted.

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Estimation of the Ratio of Residents to *Hukou* Population

	(1) Full Sample	(2) Omit <100km to Chengdu	(3) Omit City Districts & Chengdu Counties	(4) Omit <100km to Chengdu & province border	(5) Full Sample	(6) Omit <100km to Chengdu	(7) Omit City Districts & Chengdu Counties	(8) Omit <100km to Chengdu & province border
Border50*Post1997	-0.167***	-0.157***	-0.157***	-0.154***	-0.388**	-0.370**	-0.412**	-0.350*
	(0.023)	(0.021)	(0.022)	(0.022)	(0.181)	(0.169)	(0.174)	(0.192)
Border100*Post1997	-0.102***	-0.092***	-0.074**	-0.089***	-0.159	-0.135	-0.326	-0.082
	(0.031)	(0.029)	(0.029)	(0.031)	(0.349)	(0.340)	(0.325)	(0.363)
Border50	0.053**	0.043**	0.034*	0.066***	0.042*	0.033**	0.018	0.076***
	(0.022)	(0.017)	(0.020)	(0.020)	(0.023)	(0.016)	(0.023)	(0.029)
Border100	0.037**	0.024*	0.029**	0.047***	0.039**	0.029**	0.030**	0.065***
	(0.015)	(0.014)	(0.015)	(0.016)	(0.015)	(0.014)	(0.015)	(0.018)
Post1997	-0.074***	-0.084***	-0.094***	-0.088***	-0.074***	-0.084***	-0.094***	-0.073***
	(0.015)	(0.012)	(0.014)	(0.013)	(0.015)	(0.012)	(0.014)	(0.019)
Border50*Post1997*Pop1982					0.051	0.049	0.059	0.042
					(0.044)	(0.040)	(0.042)	(0.047)
Border100*Post1997*Pop1982					0.013	0.010	0.059	-0.005
					(0.081)	(0.078)	(0.075)	(0.085)
Pop1982					-0.033**	-0.025**	-0.036**	-0.028
					(0.015)	(0.011)	(0.016)	(0.019)
Constant	0.888***	0.913***	0.892***	0.850***	1.039***	1.025***	1.061***	0.960***
	(0.033)	(0.029)	(0.033)	(0.027)	(0.063)	(0.052)	(0.066)	(0.084)
Geography and Region Control	yes	yes	yes	yes	yes	yes	yes	yes
P-Value of F-Test-1					0.000	0.000	0.000	0.000
P-Value of F-Test-2					0.004	0.007	0.034	0.010
No. obs	268	224	232	168	268	224	232	212
R^2	0.353	0.538	0.450	0.635	0.367	0.549	0.475	0.386

Notes: *Border50* defined as counties within 50 kilometers from the Sichuan-Chongqing border. *Border100* defined as counties between 50-100 kilometers from the border. In columns (1) and (5), all counties are included in the sample. In columns (2) and (6), counties within 100 kilometers from Chengdu are dropped from the control region; in columns (3) and (7), city districts and counties/districts that belong to Chengdu are omitted; in columns (4) and (8), counties within 100 kilometers from Chengdu and those at the border between Sichuan and other provinces are omitted.

F-Test-1 is the joint significance test of *Border50*Post1997*and *Border50*Post1997*Pop1982*.

F-Test-2 is the joint significance test of *Border100*Post1997* and *Border100*Post1997*Pop1982*.

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix: OLS Estimation of *Hukou* Population

	(1) Full Sample	(2) Omit <100km to Chengdu	(3) Omit City Districts & Chengdu Counties	(4) Omit <100km to Chengdu & province border	(5) Full Sample	(6) Omit <100km to Chengdu	(7) Omit City Districts & Chengdu Counties	(8) Omit <100km to Chengdu & province border
Border50*Post1997	-5.588***	-7.299***	-5.776***	-6.198***	-13.189	-20.685**	-20.631**	-12.184
	(1.672)	(1.876)	(1.809)	(2.141)	(8.444)	(9.496)	(9.586)	(10.214)
Border100*Post1997	-8.809***	-10.520***	-9.818***	-9.420***	-12.673	-18.948**	-14.730	-11.039
	(1.686)	(1.833)	(1.799)	(2.054)	(9.170)	(9.203)	(9.052)	(10.181)
Border50	8.177***	8.691***	7.063***	7.518**	8.345***	8.749***	7.119***	8.238***
	(2.272)	(2.395)	(2.333)	(3.062)	(2.307)	(2.441)	(2.367)	(3.111)
Border100	6.981***	8.125***	7.134***	7.101***	6.920***	8.076***	7.151***	6.990***
	(1.843)	(1.955)	(1.932)	(2.321)	(1.839)	(1.957)	(1.943)	(2.226)
Post1997	4.185***	5.895***	4.716***	4.795***	4.185***	5.895***	4.716***	4.795***
	(1.122)	(1.315)	(1.225)	(1.582)	(1.126)	(1.322)	(1.232)	(1.573)
Border50*Post1997*Pop1982					1.759	3.098	3.465	1.385
					(1.977)	(2.214)	(2.249)	(2.387)
Border100*Post1997*Pop1982					0.890	1.942	1.139	0.373
					(2.190)	(2.204)	(2.183)	(2.462)
Pop1982					0.766	0.538	0.413	2.227**
					(0.788)	(0.931)	(0.771)	(1.098)
Constant	-1.032	-2.908	-0.877	-0.871	-4.584	-5.264	-2.816	-11.504*
	(2.907)	(3.097)	(2.985)	(3.376)	(4.588)	(4.919)	(4.485)	(6.737)
Geography and Region Control	yes	yes	yes	yes	yes	yes	yes	yes
P-Value of F-Test-1					0.002	0.000	0.001	0.000
P-Value of F-Test-2					0.000	0.000	0.000	0.000
No. obs	268	224	232	168	268	224	232	168
R^2	0.243	0.285	0.274	0.231	0.238	0.278	0.267	0.240

Notes: *Border50* defined as counties within 50 kilometers from the Sichuan-Chongqing border. *Border100* defined as counties between 50-100 kilometers from the border. In columns (1) and (5), all counties are included in the sample. In columns (2) and (6), counties within 100 kilometers from Chengdu are dropped from the control region; in columns (3) and (7), city districts and counties/districts that belong to Chengdu are omitted; in columns (4) and (8), counties within 100 kilometers from Chengdu and those at the border between Sichuan and other provinces are omitted.

F-Test-1 is the joint significance test of *Border50*Post1997*and *Border50*Post1997*Pop1982*.

F-Test-2 is the joint significance test of *Border100*Post1997* and *Border100*Post1997*Pop1982*.

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.